

## Alternative to toxic substance for water sample preservation to measure stable carbon isotopic composition of DIC: preliminary result

\*Hiroshi A Takahashi<sup>1</sup>, Hiroko Hanada<sup>1</sup>

1. Geological Survey of Japan, AIST

Carbon isotopic composition of dissolved inorganic carbon (DIC) of natural waters plays an important role in understanding of the carbon behaviors in the fields of oceanography and hydrology. It is indisputable that the isotopic change after sampling to measurement should be prevented. The employment of a toxic substance, e.g., mercuric chloride ( $\text{HgCl}_2$ ) or sodium azide ( $\text{NaN}_3$ ), to suppress biological (microbial) activities has established as a means of analyzing seawater samples. However, we cannot use the toxic substance without permission in the field campaign. Moreover, the use of toxic substance causes high ecological risks, e.g., human or organisms heaths. It requires the cost and time for disposal of wastewater. We suggested the possibility of salt ( $\text{NaCl}$ ) to inhibit microbial activities at the Goldschmidt Conference 2016. The additional examinations using salt was carried out. As the result, salt cannot be used for low DIC concentration samples to measure carbon isotopes. The carbon isotopic ratios of those samples were shown slightly lower values than those of salt-free ones. However, the carbon isotopic ratio change is negligible in high DIC concentration samples by salt addition. DIC concentration was measured lower for the salt added samples, especially high DIC concentration samples. These changes may be caused by solubility change of gas species.

Kuo (1998) utilized benzalkonium chloride (BAC: cationic surfactant) as a less hazardous alternative to  $\text{HgCl}_2$  for drinking water analysis. Gloël et al. (2015) represented that BAC could be an effective tool for short-term preservation of seawater samples, but is ineligible for sample storage over weeks to months. However, we consider that BAC has a potential for sample sterilization for DIC analysis, because BAC permeates the cytoplasmic membrane causing cell death. We examined the effect of BAC for carbon isotopic analysis of DIC samples, in order to establish procedure without using the toxic substance. Water samples were preserved into 10mL or 30mL glass vials after dissolving sugar, and BAC was added to half of those vials.

The preliminary results by groundwater, pond water and river water suggested that the BAC could be used to sample sterilization for carbon isotopic analysis of groundwater samples. DIC concentration was increased and carbon isotopic ratio was decreased during 4 weeks preservation for the no sterilized samples (BAC-free), but they were shown to be constant for the sterilized ones (BAC added). For the next step, we will examine the effectiveness of BAC to inhibit microbial activities in water using other natural water samples.

Gloël, J., Robinson, C., Tilstone, G. H., Tarran, G. and Kaiser, J. (2015) Technical note: Could benzalkonium chloride be a suitable alternative to mercuric chloride for preservation of seawater samples? *Ocean Sci.* **11**, 947-952.

Kuo, C. Y. (1998) Improved application of ion chromatographic determination of carboxylic acids in ozonated drinking water. *J Chromatogr A.* **804**, 265-272.

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